Application No.: 10/822,428
Amendment dated: December 26, 2006
Reply to Office Action of September 26, 2006
Attorney Docket No.: 21295.79 (H5786US)

a.) Amendments to Specification

Replace the paragraph [0028], in the application as published, with the following rewritten paragraph:

--[0028] FIG. 1 schematically shows the exemplary embodiment of a confocal scanning microscope 100. This is not, however, to be construed as a limitation of the invention. It is sufficiently clear to one skilled in the art that the invention can also be implemented with a conventional scanning microscope or microscope system. Illuminating light beam 3 coming from at least one illumination system 1 is directed by a beam splitter or a suitable deflection means 5 to a scanning module 7. Illuminating light beam 3 can be made up of several excitation wavelengths with which the various dyes present in a sample are excited. Before illuminating light beam 3 strikes deflection means 5, it passes through an illumination pinhole 6. Scanning module 7 encompasses a gimbal-mounted scanning mirror 9 that guides illuminating light beam 3, through a scanning optical system 12 and a microscope optical system 13, over or through a sample 15 equipped with at least two fluorescent dyes. With non-transparent samples 15, illuminating light beam 3 is guided over the sample surface. With biological samples 15 (preparations) or transparent samples, illuminating light beam 3 can also be guided through sample 15. This means that different focal planes of sample 15 are scanned successively by illuminating light beam 3. Connected to scanning module 7 is a position sensor 11 that determines the position data of the acquired image data. Subsequent combination of the position data and image data then yields a two- or three-dimensional frame (or image) of sample 15. Illuminating light beam 3 coming from illumination system 1 is depicted as a solid line. The light proceeding from sample 15 defines a detected light beam 17. The latter travels through microscope optical system 13, scanning optical system 12 and via scanning module 7 to deflection means 5, passes through the latter, and travels through a detection pinhole 18 onto at least one detector 19 that encompasses at least two channels. Each of the channels can be embodied as a photomultiplier. It is clear to one skilled in the art that other detection components, for example diodes, diode arrays, photomultiplier arrays, CCD chips, or CMOS image sensors, can also be used. Detected light beam 17 proceeding from or defined by sample 15 is depicted in FIG. 1 as a dashed line. Electrical

detected signals proportional to the power level of the light proceeding from sample 15 are generated in detector 19. Since light of not only one wavelength is emitted from sample 15, it is advisable to insert, in front of the various channels of the at least one detector 19, a selection means ~~21~~ for the spectrum proceeding from sample 15. The data generated by detector 19 are forwarded to a computer system 23. At least one peripheral device 27 is associated with computer system 23. The peripheral device can be, for example, a display on which the user receives instructions for separating the spectrum proceeding from sample 15. Also depicted on the display is, for example, a user interface such as the one shown, for example, in FIG. 3. Additionally associated with computer system 23 is an input means that comprises, for example, a keyboard 28, an adjusting apparatus 29 for the components of the microscope system, and a mouse 30.--

Replace the paragraph [0029], in the application as published, with the following rewritten paragraph:

--[0029] FIG. 2 shows the embodiment of a scanning microscope in which an SP (spectral photometer) module 20 is arranged, as selection means, in front of the at least one detector 19. Other selection means, for example a micromirror array, are also conceivable. All other elements shown in FIG. 2 conform to those in FIG. 1, so they need not be mentioned again in the description of FIG. 2. SP module 20 (FIG. 2) acquires a complete lambda scan; i.e. for each sample point, all wavelengths proceeding from sample 15 are recorded. The data are transferred to computer system 23 and can then be presented on display 27 in a manner that can be determined by the user. Detected light beam 17 is spatially spectrally divided by a prism 31. A further possibility for spectral division is the use of a reflection grating or transmission grating. The spectrally divided light fan 32 is focused by focusing optical system 33, and then strikes a mirror stop arrangement 34, 35. Mirror stop arrangement 34, 35, the means for spectral spatial division (prism ~~67~~ 31), focusing optical system 33, and detectors 36 and 37 are together referred to as SP module 20 (or the multi-band detector). As is evident from FIG. 2 ~~3~~, a desired portion of the spectrum can be selected by means of mirror stop arrangement 34,

35. For that purpose, mirror stop arrangement 34, 35 in SP module 20 is correspondingly adjusted, depending on the separation that is ascertained, so as to direct only specific portions of the spectrum proceeding from sample 15 onto a respective individual detector. One portion of the divided light fan 32 of detected light beam 17, encompassing only light of the preselected spectral region, passes through mirror stop arrangement 34, 35 and is detected by detector 36, which is embodied as a photomultiplier. Another portion of the divided light fan 32 is reflected at mirror stop arrangement 35 and arrives at detector 37, which is likewise embodied as a photomultiplier. Mirror stop arrangements 34, 35 are displaceable in the directions illustrated by the double arrows, so that the spectral detection regions of the light conveyed to detectors 36, 37 are continuously adjustable. It is possible, although not depicted for reasons of clarity, also to install further detectors and to associate them with further mirror stops. In detectors 36, 37, electrical detected signals proportional to the power level of detected light beam 17 of the respective spectral region proceeding from sample 15 are generated, and are associated in computer system 23 with the position signals sensed in the beam deflection device by means of a position sensor.—

Replace the paragraph [0031] in the application as published, with the following rewritten paragraph:

--[0031] The calculated data of the channels are displayed to the user on display 27; all possible presentation modes (overlay, volume rendering, etc.) can be incorporated into the depiction. To achieve the presentation on display 27, simulator ~~104~~ is connected to computer system 23 ~~as shown~~ in FIG. 1 ~~3~~. Without stressing specimen 15 (thermally, with radiation, etc.), the user can continue for an appropriate period of time until he is satisfied with the image depicted on display 27. Pressing a key saves the setting and makes it available, as a filter macro or setting macro of SP module 20, for further work with the same specimen 15 or similar specimens. The scanning microscope is also schematically illustrated in the portion of user interface 40 depicted in FIG. 3, and a plurality of setting possibilities are made available to the user. In the embodiment

described, a first laser 45 and a second laser 47 are provided, both schematically depicted as a box. First laser 45 is, for example, an argon UV (ArUV) laser that emits light of a first wavelength of 351 nm and light of a second wavelength of 364 nm. Second laser 47 is, for example, an argon-krypton (ArKr) laser that emits light of a first wavelength of 476 nm, light of a second wavelength of 514 nm, light of a third wavelength of 568 nm, and light of a fourth wavelength of 647 nm. Provided in each box, for each of the available wavelengths, is a slide controller 50 with which the percentage of the respective wavelength contained in the laser output can be adjusted. Also provided in each box is an indicator 46, 48 which reports the operating state of the respective laser and/or with which the laser can be switched on or off. Depicted alongside the box for second laser 47 is a data structure 52 showing how data are stored in the memory of computer system 23. Additionally depicted schematically on the display are the sample ~~15~~ and a light beam ~~55~~ coming from lasers 45, 47, a light beam 56 transmitted by the sample ~~15~~, and a light beam 57 emanating from the sample ~~15~~ in the direction of the illuminating light beam ~~55~~. The light beams are correspondingly directed by a schematically depicted beam deflection device 58. In FIG. 3 the light beam 57 coming from the sample ~~15~~ points toward a representation of a spectrum 60. The lines emitted by first and second laser 45, 47 are plotted in spectrum 60. Also depicted in spectrum 60 are the intensity and the spectral position of light 57 reflected from sample 15. In the exemplary embodiment depicted here, a first intensity curve 62, a second intensity curve 64, and a third intensity curve 66 are depicted in spectrum 60. Provided below spectrum 60 is a scale 68 that serves as an orientation aid for selection sliders 41_{green}, 41_{red}, 41_{blue}, or 41_{gray} arranged therebelow. Selection sliders 41_{green}, 41_{red}, 41_{blue}, or 41_{gray} are moved on user interface 40 with the mouse or a similar means. A first detector 74, a second detector 75, a third detector 76, and a fourth detector 77 are depicted, again schematically as boxes, below selection sliders 41_{green}, 41_{red}, 41_{blue}, or 41_{gray}. An indicator for dye selection is provided in each box. Indicator 78 is configured as a drop-down indicator, so that the user can easily select a different fluorescent dye present in the sample ~~15~~. Further associated with each box is a color description 79 which indicates how the signals of the respective detector are being used for image generation on the display. The operating state of each

detector is indicated in each box by way of an activatable click box 80. A fifth detector, which likewise comprises indicator 78 for the dye detected by detector, box 79 for the color description, and the activatable click box 80, is associated with the light transmitted by the sample ~~15~~.--

Replace the paragraph [0037], in the application as published, with the following rewritten paragraph:

-- [0037] FIG. 9 shows, in a graph, all the emissions 115 ~~1115~~, 116, 117 of the fluorescent dyes provided in sample 15, for the various excitations. The spectra of the emissions depicted in FIG. 6, FIG. 7, and FIG. 8 are combined in one graphic depiction, wavelength being plotted on the abscissa and relative units on the ordinate. First emission 115 represents the excitation of the three fluorescent dyes provided in sample 15 for the 357 nm excitation. Second emission 116 represents the excitation of the three fluorescent dyes provided in sample 15 for the 488 nm excitation. Third emission 117 represents the excitation of the three fluorescent dyes provided in sample 15 for the 576 nm excitation. FIG. 9 depicts an embodiment for the determination of separation points 118 in order to allocate a certain portion of the emission spectrum to a certain channel. Separation points 118 are determined by projecting intersection points 119 of emissions 115, 116, and 117 onto the abscissa. This results in a separation, a first channel 131 encompassing the wavelength region from 400 to 520 nm, a second channel 132 the wavelength region from 520 to 580 nm, and a third channel 133 the wavelength region from 580 to 750 nm.--